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10/516,714	02/06/2006	Vincent Le Nir	F40.12-0030	6619

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EXAMINER
FLORES, LEON

ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 July 2009*.
2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.
     4a) Of the above claim(s) *2 and 11* is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) *1,3-6 and 8-10* is/are rejected.
7)☒ Claim(s) *7* is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.
10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
     a)☒ All   b)☐ Some *   c)☐ None of:
       1.☐ Certified copies of the priority documents have been received.
       2.☐ Certified copies of the priority documents have been received in Application No. _____.
       3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
     * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☐ Information Disclosure Statement(s) (PTO/SB/08)
     Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
     Paper No(s)/Mail Date. _____.
5)☐ Notice of Informal Patent Application
6)☐ Other: _____.

DETAILED ACTION

Response to Arguments

1.   Applicant's arguments with respect to claims (1, 3-10) have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 102

1.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2.   **Claims (1, 3-5 & 9) are rejected under 35 U.S.C. 102(e) as being anticipated by Horng et al. (hereinafter Horng) (US Patent 7,263,132 B2)**

Re claim 1, Horng discloses a method for sending a signal implementing Nt transmit antennas, with $Nt \geq 2$, wherein the method implements the following steps, for at least one vector comprising N symbols to be sent: dividing said vector into Nt sub-vectors (See fig. 1: 110 "each of these vectors are transmitted using Nt antennas 120); multiplying each of the Nt sub-vectors by a distinct sub-matrix sized (N/Nt, N) (See fig. 1: 102 & equation 1 "it is inherent based on equation 1 that the matrix is split into 2 sub-matrices sized <N/Nt, N> where each row is transmitted through different antennas Nt"), each sub-matrix being associated with one of the transmit antennas (See fig. 1: 102 & equation 1), and said sub-matrices being obtained by subdivision of a unitary square

matrix sized (N,N)(See fig. 1: 110 & equation 1 "it is inherent & well known in the art that

a unitary matrix is used in STTD encoding" "based on equation 1 the size of the unitary

matrix is N by N") and sending, from the Nt transmit antennas, the Nt sub-vectors

resulting from the multiplying step. (See fig. 1: 102, 120)

Re claim 3, Horng further discloses that wherein N/Nt is greater than or equal to

2. (See fig. 1 "N is 4 symbols & Nt is 2 antennas, therefore 4/2 is equal to 2")

Re claim 4, Horng further discloses that wherein said unitary matrix is full. (See

equation 1. "it is inherent that the unitary matrix used to perform STTD encoding is a

full matrix")

Re claim 5, Horng further discloses that wherein said unitary matrix belongs to

the group comprising: the real Hadamard matrices; the complex Hadamard matrices;

the Fourier matrices; the real rotation matrices; the complex rotation matrices. (See fig.

1: 110 "STTD encoding" & equation 1. "it is inherent & well known in the art the use of

hadamard matrices in order to yield orthogonal codes such as Alamouti codes".)

Re claim 9, Horng further discloses a method for t-he reception of a signal

corresponding to t-he a combination of contributions of Nt transmit antennas, with Nt$\geq$2,

wherein for at least one vector comprising N symbols to be sent, the signal is generated

by dividing said vector into Nt sub-vectors, multiplying each of the Nt sub-vectors by a

distinct sub-matrice, each sub-matrix being associated with one of the transmit

antennas, and said sub-matrices being obtained by subdivision of a unitary square

matrix, and sending, from the Nt transmit antennas, the Nt sub-vectors resulting from

the multiplying step, wherein the signal forms, seen from a receiver, a single combined

signal representing the multiplication, wherein the method of reception comprises:

implementing at least one receiver antenna (See fig. 1: 201); receiving said single

combined signal on each of said receiver antennas (See fig. 1: 201); and decoding said

single combined signal a decoding matrix corresponding to a matrix that is the

conjugate transpose of said unitary matrix. (See equations 2 & 3 "it is inherent & well

known that H depends on the code matrix and the channel")

Claim Rejections - 35 USC § 103

3.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

4.   The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148

USPQ 459 (1966), that are applied for establishing a background for determining

obviousness under 35 U.S.C. 103(a) are summarized as follows:

1.   Determining the scope and contents of the prior art.
2.   Ascertaining the differences between the prior art and the claims at issue.
3.   Resolving the level of ordinary skill in the pertinent art.
4.   Considering objective evidence present in the application indicating
        obviousness or nonobviousness.

5. **Claims (6 & 10) are rejected under 35 U.S.C. 103(a) as being unpatentable over Horng et al (hereinafter Horng) (US Patent 7,263,132 B2), as applied to claim 1 above, and further in view of Hottinen et al. (hereinafter Hottinen) (US Patent 7,436,896 B2)**

Re claim 6, the reference of Horng fails to explicitly teach that wherein implements two transmitter antennas and said sub-matrices have a value of [1 1] and [1 -1].

However, Hottinen does. (See equation 7) Hottinen suggests that wherein implements two transmitter antennas and said sub-matrices have a value of [1 1] and [1 -1].

Therefore, taking the combined teachings of Horng & Hottinen <u>as a whole</u>, it would have been obvious to one of ordinary skills in the art to incorporate these features into the system of Horng, in the manner as claimed and as taught by Hottinen, for the benefit of maintaining better power balance. (See col. 6, lines 31-32)

Re claim 10, although it is well known in the art to use maximum likelihood decoding, the reference of Horng fails to explicitly teach that wherein a maximum likelihood decoding is applied to the data coming from the multiplication by said conjugate transpose matrix.

However, Hottinen does. (See col. 6, lines 45-67) Hottinen discloses that wherein a maximum likelihood decoding is applied to the data coming from the multiplication by said conjugate transpose matrix.

Therefore, taking the combined teachings of Horng & Hottinen <u>as a whole</u>, it

would have been obvious to one of ordinary skills in the art to incorporate these features

into the system of Horng, in the manner as claimed and as taught by Hottinen, for the

benefit of estimating the transmitted bits.

6.   **Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over**

Horng et al (hereinafter Horng) (US Patent 7,263,132 B2), as applied to claims 1 &

9 above, and further in view of Agrawal et al. (hereinafter Agrawal) (US Patent

6,873,606 B2)

Re claim 8, although the number of antennas is purely a designer's choice when

dealing with MIMO systems, the reference of Horng fails to explicitly teach that wherein

the method implements four transmitter antennas and that said sub-matrices have a

value $[1 \; 1 \; 1 \; 1], [1 \; -1 \; 1 \; -1], [1 \; 1 \; -1 \; -1]$ and $[1 \; -1 \; -1 \; 1]$.

However, Agrawal does. (See equations 10-12) Agrawal discloses a Matrix M

which has these four sub-matrices.

Therefore, taking the combined teachings of Horng and Agrawal <u>as a whole</u>, it

would have been obvious to one of ordinary skills in the art to incorporate these features

into the system of Horng, in the manner as claimed and as taught by Agrawal, for the

benefit of satisfying the per-antenna power constraint.

Allowable Subject Matter

7.   Claim 7 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Contact

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LEON FLORES whose telephone number is (571)270-1201. The examiner can normally be reached on Mon-Fri 7-5pm Alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Payne can be reached on 571-272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/L. F./
Examiner, Art Unit 2611
July 21, 2009

/Mohammad H Ghayour/
Supervisory Patent Examiner, Art Unit 2611